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European Journal of Heart Failure 4 (2002) 11–22

The European Journal of Heart Failure

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Comprehensive guidelines for the diagnosis and treatment of chronic heart failure Task force for the diagnosis and treatment of chronic heart failure of the European Society of Cardiology ☆

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Received 19 October 2001; accepted 26 October 2001

1. Diagnosis of chronic heart failure

1.1. Introduction and methodology

The aim of this report is to provide practical guidelines for the diagnosis, assessment and treatment of heart failure for use in clinical practice and in addition for epidemiological surveys and for clinical trials. The recommendations in these guidelines should always be considered in the light of local regulatory requirements for the administration of any chosen drug or device. This report is a comprehensive summary of the full report [1]. The full report should be used when in doubt or when further information is required.

1.1.1. Level of evidence

Recommendations regarding treatments have been based on the degree of available evidence.

Level of evidence	Available evidence
A	At least two randomised trials supporting recommendation
B	One randomised trial and/or meta-analysis supporting recommendation
C	Consensus statement from experts based on trials and clinical experience

1.2. Systolic versus diastolic heart failure

Heart failure is usually associated with evidence of left ventricular (LV) systolic dysfunction, although diastolic impairment at rest is a common if not universal accompaniment. Diastolic heart failure is often presumed to be present when symptoms and signs of heart failure occur in the presence of a preserved LV systolic function.

1.3. Diagnosis of chronic heart failure

- Heart failure is a syndrome where the patients should have the following features; symptoms of heart failure, typically breathlessness or fatigue, either at rest or during exertion, or ankle swelling and objective evidence of cardiac dysfunction at

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PII: S1388-9842(01)00231-8

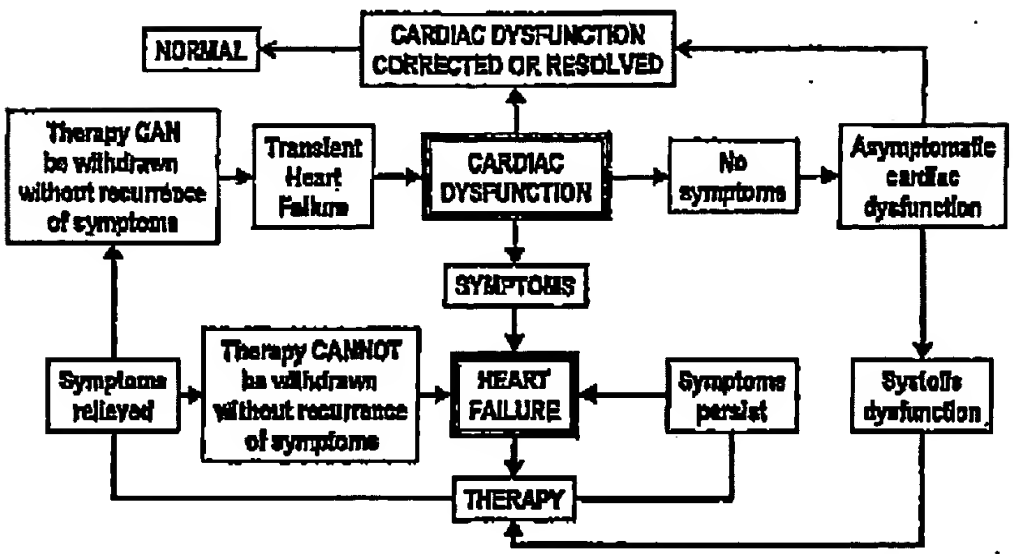

Fig. 1. Relationship between cardiac dysfunction, heart failure and heart failure rendered asymptomatic.

rest. A clinical response to treatment directed at heart failure alone is supportive but not sufficient for the diagnosis. Fig. 1 presents the relationship between different clinical manifestations of heart failure

- Heart failure should never be the final diagnosis.

The aetiology of heart failure and the presence of exacerbating factors or other diseases that may have an important influence on management should be considered carefully in all cases.

1.4. Importance of identifying potentially reversible exacerbating factors

Symptoms of chronic heart failure, pulmonary oedema and shock may be caused by tachy- and bradyarrhythmias or myocardial ischaemia even in patients without major, permanent cardiac dysfunction. It is important to identify any reversible factors in order to treat heart failure optimally.

1.5. Symptoms and signs in the diagnosis of heart failure

- Fatigue, dyspnoea and peripheral oedema are typical symptoms and signs of heart failure, but not necessarily specific. The clinical suspicion of heart failure must be confirmed by more objective tests particularly aimed at assessing cardiac function. (Fig. 2)
- There is a poor relationship between symptoms and the severity of cardiac dysfunction and between symptoms and prognosis.

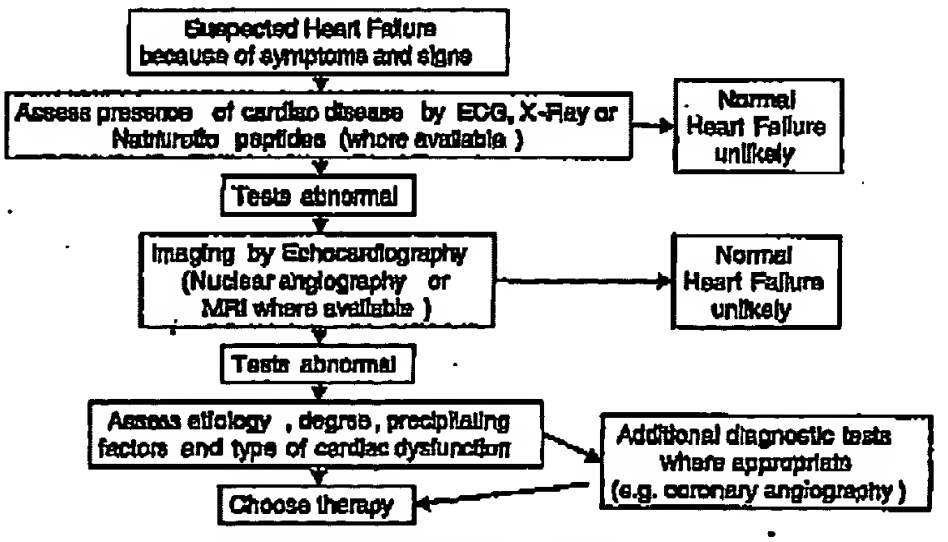

Fig. 2. Algorithm for the diagnosis of heart failure.

Once a diagnosis of heart failure has been established symptoms may be used to classify the severity of heart failure, e.g. by NYHA class or into mild, moderate or severe and should be used to monitor the effects of therapy.

1.6. Electrocardiogram

- A normal ECG suggests that the diagnosis of chronic heart failure should be carefully reviewed.

Electrocardiographic changes in patients with heart failure are frequent. The negative predictive value of normal ECG to exclude LV systolic dysfunction exceeds 90%

1.7. The chest X-ray

- Chest X-ray should be part of the initial diagnostic work-up in heart failure. It is useful to detect cardiomegaly and pulmonary congestion; however, it has only predictive value in the context of typical signs and symptoms and an abnormal ECG.

1.8. Haematology and biochemistry

- Routine diagnostic evaluation of patients with chronic heart failure includes: complete blood count (Hb, leukocytes, platelets), *S*-electrolytes, *S*-creatinine, *S*-glucose, *S*-hepatic enzymes and urinalysis. In acute exacerbations exclude acute myocardial infarction by myocardial specific enzyme analysis.

1.9. Echocardiography

- Objective evidence of cardiac dysfunction at rest is necessary for the diagnosis of heart failure. Echocardiography is the preferred method.

The most important parameter of ventricular function is the LV ejection fraction for distinguishing patients with cardiac systolic dysfunction and those with preserved systolic function. Echocardiography also provides rapid and semi-quantitative assessment of valvular function, cardiac filling characteristics through Doppler measurements, and is helpful in determining the etiology of heart failure.

1.10. Additional non-invasive tests to be considered

In patients where echocardiography at rest has not provided enough information and in severe or refractory chronic heart failure and coronary artery disease, further non-invasive imaging may include:

Stress echocardiography
Nuclear cardiology
Cardiac magnetic resonance imaging (CMR)

1.11. Pulmonary function

- Measurements of lung function are of little value in diagnosing chronic heart failure. However, they are useful in excluding respiratory causes of breathlessness.

1.12. Exercise testing

- In clinical practice exercise testing is of limited value for the diagnosis of heart failure. However, a normal maximal exercise test, in a patient not receiving treatment for heart failure, excludes heart failure as a diagnosis. Exercise testing in chronic heart failure may be useful for prognostic stratification.

1.13. Invasive investigation

- Invasive investigation is generally not required to establish the presence of chronic heart failure but may be important in elucidating the cause in individual patients (e.g. endomyocardial biopsy) or to obtain prognostic information.

Coronary angiography and hemodynamic monitoring should be considered in patients with acute or acutely decompensated chronic heart failure and in the presence of severe heart failure (shock or acute pulmonary oedema) not responding to initial treatment. Routine hemodynamic monitoring should not be used to tailor therapy in chronic heart failure

1.14. Natriuretic peptides

- Plasma concentrations of certain natriuretic peptides can be helpful in the diagnostic process, especially in untreated patients.

These peptides may be most useful clinically as a 'rule out' test due to consistent and very high negative predictive values.

1.15. Other neuroendocrine evaluations

- Other tests of neuroendocrine activation are not

Table 1
Assessments to be performed routinely to establish the presence and likely cause of heart failure

Assessments	The diagnosis of heart failure			Suggests alternative or additional diagnosis
	Necessary for	Supports	Opposes	
Appropriate symptoms	+++		+++ (If absent)	
Appropriate signs		+++	+ (If absent)	
Cardiac dysfunction on imaging (usually echocardiography)	+++		+++ (If absent)	
Response of symptoms or signs to therapy		+++	+++ (If absent)	
ECG			+++ (If normal)	
Chest X-ray		If pulmonary congestion	+ (If normal)	Pulmonary disease
Full blood count				Anaemia/Secondary polycythemia
Biochemistry and urinalysis		or cardiomegaly		Renal or hepatic disease/diabetes
Plasma concentration of natriuretic peptides in untreated patients (where available)		+ (If elevated)	+++ (If normal)	

+, of some importance; +++, of great importance.

recommended for diagnostic or prognostic purposes in individual patients.

1.16. Holter electrocardiography (ambulatory ECG, long time ECG recording — LTKR)

- Conventional Holter monitoring is of no value in the diagnosis of chronic heart failure, though it may detect and quantify the nature, frequency, and duration of atrial and ventricular arrhythmias which could be causing or exacerbating symptoms of heart failure. Ambulatory electrocardiographic monitoring should be restricted to patients with chronic heart failure and symptomatic arrhythmias.

1.17. Requirements for the diagnosis of heart failure in clinical practice

To satisfy the definition of heart failure, symptoms and/or signs of heart failure and objective evidence of cardiac dysfunction, preferably obtained by echocardiography, must both be present. Conditions which mimic or exacerbate the symptoms and signs of heart failure need to be excluded (Table 1). Fig. 2 presents a diagnostic scheme to be performed routinely in patients with suspected heart failure. Additional tests (Table 2) should be performed or re-evaluated in cases where diagnostic doubt persists or clinical features suggest a reversible cause for heart failure.

Table 2
Additional tests to be considered to support the diagnosis or to suggest alternative diagnoses

Tests	The diagnosis of heart failure		Suggests alternative or additional diagnosis
	Supports	Opposes	
Exercise Test	+ (If impaired)	+++ (If normal)	
Pulmonary function tests			Pulmonary disease
Thyroid function tests			Thyroid disease
Invasive investigation and angiography			Coronary artery disease, ischemia
Cardiac output	+++ (If depressed at rest)	+++ (If normal; especially during exercise)	
Left atrial pressure	+++ (If elevated at rest)	+++ (If normal; in absence of therapy)	

+, of some importance; +++, of great importance.

Table 3
Management outline

1	Establish that the patient has heart failure
2	Ascertain presenting features: pulmonary oedema, exertional breathlessness, fatigue, peripheral oedema
3	Assess severity of symptoms
4	Determine aetiology of heart failure
5	Identify precipitating and exacerbating factors
6	Identify concomitant diseases relevant to heart failure and its management
7	Estimate prognosis
8	Anticipate complications
9	Counsel patient and relatives
10	Choose appropriate management
11	Monitor progress and manage accordingly

Table 3 provides a management outline which connects the diagnosis part of the guidelines with the treatment section.

2. Treatment of heart failure

The aims of treatment in heart failure are:

1. Prevention — a primary objective:
   - Prevention and/or controlling of diseases leading to cardiac dysfunction and heart failure.
   - Prevention of progression to heart failure once cardiac dysfunction is established.
2. Maintenance or improvement in quality of life.
3. Improved survival.

2.1. Management of chronic heart failure

The therapeutic approach in chronic heart failure due to cardiac systolic dysfunction consists of general advice and other non-pharmacological measures, pharmacological therapy, mechanical devices and surgery.

2.2. Non-pharmacological management

General advice and measures (Table 4)

Level C for all advice and measures unless stated otherwise

Rest, exercise and exercise training (Table 4)

Level C for all recommendations unless stated otherwise

2.3. Pharmacological therapy: angiotensin-converting enzyme inhibitors

- ACE inhibitors are recommended as first-line therapy in patients with a reduced LV systolic function expressed as a subnormal ejection fraction, i.e. < 40–45 (level A). Asymptomatic patients with LV systolic dysfunction benefit from long-term ACE inhibition (level A). All patients with symptomatic heart failure due to systolic LV dysfunction should receive an ACE inhibitor (level A). In the absence of fluid retention, ACE inhibitors should be given first. In patients with fluid retention together with diuretics (level B).
- ACE inhibitors should be uptitrated to the dosages shown to be effective in the large, controlled trials in heart failure (level A), and not titrated based on symptomatic improvement alone (level C) — see full text for dosages.

Important adverse effects associated with ACE inhibitors are hypotension, syncope, renal insufficiency, hyperkalaemia and angioedema.

Changes in systolic and diastolic blood pressure and increases in serum creatinine are usually small in normotensive patients.

Initiating ACE inhibitor therapy (Table 5)

2.4. Diuretics

2.4.1. Loop diuretics, thiazides and metolazone

- Diuretics are essential for symptomatic treatment when fluid overload is present and manifest as pulmonary congestion or peripheral oedema (level A), although there are no controlled, randomised trials that have assessed the effect on survival of these agents. The use of diuretics results in rapid improvement of dyspnoea and increased exercise tolerance (level B).
- Diuretics should always be administered in combination with ACE inhibitors if possible (level C).

Detailed recommendations and major side effects are outlined in Table 6.

2.5. Potassium-sparing diuretics

- Potassium-sparing diuretics should only be pre-

Table 4
General advice and measures

General advice	
	•Explain what heart failure is and why symptoms occur
	•Causes of heart failure
	•How to recognize symptoms
	•What to do if symptoms occur
	•Self-weighing
	•Rationale of treatments
	•Importance of adhering to pharmacological and non-pharmacological prescriptions
	•Refrain from smoking — use of nicotine replacement therapies
	•Prognosis
Drug counselling	
	•Effects
	•Dose and time of administration
	•Side effects and adverse effects
	•Signs of intoxication
	•What to do in case of skipped doses
	•Self-management
Rest and exercise	
	•Rest — not encouraged in stable conditions
	•Work
	•Daily physical and leisure activities in stable patients to prevent muscle deconditioning
	•Sexual activity
	•Rehabilitation — exercise training programmes in stable NYHA II/III — see full text for details
Vaccinations	•advice on immunisations
Travel	•advice on possible problems with long flights and severe heart failure, high altitudes, hot humid climates and diuretic/vasodilator use
Dietary and social habits	•Control sodium intake when necessary, e.g. some patients with severe heart failure
	•Avoid excessive fluids in severe HF
	•Avoid excessive alcohol intake

scribed if persisting hypokalaemia despite ACB inhibition or, in severe heart failure despite the combination ACB inhibition and low-dose spironolactone (level C).

- Potassium supplements are less effective in this situation (level B) (Table 6).

Table 5
The recommended procedure for starting an ACE inhibitor

1	Review the need for and dose of diuretics and vasodilators
2	Avoid excessive diuresis before treatment. Reduce or withhold diuretics, if being used, for 24 h.
3	It may be advisable to start treatment in the evening, when supine, to minimize the potential negative effect on blood pressure, although there are no data in heart failure to support this (evidence C). When initiated in the morning, supervision for several hours with blood pressure control is advisable.
4	Start with a low dose and build up to recommended maintenance dosages shown to be effective in large trials (see full text)
5	If renal function deteriorates substantially, stop treatment.
6	Avoid potassium-sparing diuretics during initiation of therapy.
7	Avoid non-steroidal anti-inflammatory drugs (NSAIDs).
8	Check blood pressure, renal function and electrolytes 1–2 weeks after each dose increment, at 3 months and subsequently at 6 monthly intervals.

The following patients should be referred for specialist care:

1	Cause of heart failure unknown
2	Systolic blood pressure < 100 mmHg
3	Serum creatinine > 150 μmol/l
4	Serum sodium < 135 mmol/l
5	Severe heart failure
6	Valve disease as primary cause

Table 6
Diuretics

Initial diuretic treatment	Loop diuretics or thiazides. Always administered in addition to an ACE inhibitor If GFR < 30 ml/min do not use thiazides, except as therapy prescribed synergistically with loop diuretics.
Insufficient response	Increase dose of diuretic Combine loop diuretics and thiazides With persistent fluid retention: administer loop diuretics twice daily In severe chronic heart failure add metolazone with frequent measurement of creatinine and electrolytes
Potassium-sparing diuretics: triamterene, amiloride, spironolactone	Use only if hypokalaemia persists after initiation of therapy with ACE inhibitors and diuretics. Start 1-week low-dose administration, check serum potassium and creatinine after 5–7 days and titrate accordingly. Recheck every 5–7 days until potassium values are stable

GFR, glomerular filtration rate; CHF, chronic heart failure; ACE, angiotensin converting-enzyme.

2.6. *Beta-adrenoceptor antagonists*

- Beta-blocking agents are recommended for the treatment of all patients with stable, mild, moderate and severe heart failure and reduced LV ejection fraction, in NYHA class II–IV, on standard treatment, including diuretics and ACE inhibitors, unless there is a contraindication (level A).
- In patients with LV systolic dysfunction, with or without symptomatic heart failure, following an acute myocardial infarction long term beta-blockade is recommended in addition to ACE inhibition to reduce mortality (level B).

Initiation of therapy — see Table 7

2.7. *Aldosterone receptor antagonists — spironolactone*

- Aldosterone antagonism is recommended in advanced heart failure (NYHA III–IV), in addition to ACE inhibition and diuretics to improve survival and morbidity (level B). Administration and dosing are shown in Table 8.

2.8. *Angiotensin II receptor antagonists (ARBs)*

- ARBs could be considered in patients who do not tolerate ACE inhibitors for symptomatic treatment (level C).
- However, it is unclear whether ARBs are as effective as ACE inhibitors for mortality reduction (level B).
- In combination with ACE inhibition, ARBs may improve heart failure symptoms and reduce hospitalisations for worsening heart failure (level B).

Whether concomitant beta-blockade negatively affects the effect of ARB needs further evaluation

2.8.1. *Safety and tolerability*

Side effects, notably cough are significantly less than with ACE-inhibitors.

2.9. *Cardiac glycosides*

- Cardiac glycosides are indicated in atrial fibrillation and any degree of symptomatic heart failure, whether or not LV dysfunction is the cause, in order to slow ventricular rate, thereby improving ventricular function and symptoms (level B). A combination of digoxin and beta-blockade appears superior than either agent alone (level C).
- In sinus rhythm, digoxin is recommended to improve the clinical status of patients with persisting heart failure symptoms due to left ventricular systolic dysfunction despite ACE inhibitor and diuretic treatment (level B).

Contraindications: bradycardia, second- and third-degree AV-block, sick sinus syndrome, carotid sinus syndrome, hypokalaemia and hypercalcaemia.

2.9.1. *Digoxin*

The usual daily dose of oral digoxin is 0.25–0.375 mg if serum creatinine is in the normal range (in the elderly 0.625–0.125 mg, occasionally 0.25 mg). No loading dose is needed when treating chronic conditions. The treatment can be initiated with 0.25 mg bid. for 2 days.

2.10. *Vasodilator agents in chronic heart failure*

- There is no specific role for vasodilators in the

Table 7
The recommended procedure for starting a beta-blocker

Patients should be on a background therapy with ACE inhibition, if not contraindicated.
The patient should be in a relatively stable condition, without the need of intravenous inotropic therapy and without signs of marked fluid retention
Start with a very low dose and titrate up to maintenance dosages shown to be effective in large trials. The dose may be doubled every 1–2 weeks if the preceding dose was well tolerated. Most patients can be managed as out-patients.

Transient worsening failure, hypotension or bradycardia may occur during the titration period or thereafter
- Monitor the patient for evidence of heart failure symptoms, fluid retention, hypotension and bradycardia
- If worsening of symptoms, first increase the dose of diuretics or ACE-inhibitor; temporarily reduce the dose of beta-blockers if necessary
- If hypotension, first, reduce the dose of vasodilators; reduce the dose of the beta-blocker if necessary
- Reduce or discontinue drugs that may lower heart rate in presence of bradycardia; reduce dose of beta-blockers if necessary, but discontinue only if clearly necessary.
- Always consider the reintroduction and/or uptitration of the beta-blocker when the patient becomes stable

If inotropic support is needed to treat a decompensated patient on beta-blockade, phosphodiesterase inhibitors should be preferred because their haemodynamic effects are not antagonized by beta-blocker agents.

The following patients should be referred for specialist care
- Severe heart failure class III/IV
- Unknown etiology
- Relative contraindications; bradycardia, low blood pressure
- Intolerance to low dose beta-blockade
- Previous use of beta-blocker and discontinuation because of symptoms
- Suspected asthma or bronchial disease

Contraindications to beta-blockers in patients with heart failure
- Asthma bronchiale
- Severe bronchial disease
- Symptomatic bradycardia or hypotension

treatment of heart failure (level A), although they may be used as adjunctive therapy for angina or concomitant hypertension (level C).
- In case of intolerance for ACE inhibitors ARBs are preferred to the combination hydralazine–nitrates (level A).
- In general, calcium antagonists are not recommended for the treatment of heart failure due to systolic dysfunction.

2.11. Positive inotropic therapy

- Inotropic agents are commonly used to limit severe episodes of heart failure or as a bridge to heart transplantation in end-stage heart failure (level C). However, treatment-related complications may occur and their effect on prognosis is not well recognised
- Repeated or prolonged treatment with oral inotropic agents increases mortality (level A).
- Currently, insufficient data are available to recommend dopaminergic agents for heart failure treatment.

2.12. Anti-thrombotic agents

- There is little evidence to show that anti-thrombotic therapy modifies the risk of death, or vascular events in patients with heart failure other than in

Table 8
Administration and dosing considerations with spironolactone

1	Consider whether a patient is in severe heart failure (NYHA III–IV) despite ACE inhibition/diuretics
2	Check serum potassium (< 5.0 mmol/l) and creatinine (< 250 μmol/l)
3	Add 25 mg spironolactone daily
4	Check serum potassium and creatinine after 4–6 days
5	If at any time serum potassium > 5–5.5 < mmol/l, reduce dose by 50%. Stop if serum potassium > 5.5mmol/l.
6	If after 1 month symptoms progress and normokalemia exists, increase to 50 mg daily. Check serum potassium/creatinine after 1 week.

the setting of atrial fibrillation when anti-coagulation is firmly indicated (level C).

2.13. Antiarrhythmics

- In general, there is no indication for the use of anti-arrhythmic agents in heart failure (level C).

2.13.1. Class I anti-arrhythmics

Class I anti-arrhythmics should be avoided (level C).

2.13.2. Class II anti-arrhythmics

Beta-blockers reduce sudden death in heart failure (level A).

They may be indicated in the management of sustained or non-sustained ventricular tachy-arrhythmias, either alone or in combination with amiodarone or non-pharmacological therapy (level C).

2.13.3. Class III anti-arrhythmics

Amiodarone is effective against most supraventricular and ventricular arrhythmias (level B). But routine administration of amiodarone in patients with heart failure is not justified (level B).

2.14. Devices and surgery: revascularisation procedures, mitral valve surgery, cardiomyoplasty and partial left ventriculotomy

- Surgical treatment should be directed towards the underlying etiology and mechanisms. In addition to revascularisation, it is important to approach patients with significant valvular disease, e.g. aortic stenosis, before they develop significant LV dysfunction.

2.14.1. Revascularisation

There are no controlled data to support the use of revascularisation procedures for the relief of heart failure symptoms, but in individual patients with heart failure of ischaemic origin revascularisation may lead to symptomatic improvement (level C).

2.14.2. Mitral valve surgery

Mitral valve surgery in patients with severe left ventricular dysfunction and severe mitral valve insufficiency may lead to symptomatic improvement in selected heart failure patients (level C).

Cardiomyoplasty and partial left ventriculotomy (Batista procedure) cannot be recommended for the treatment of heart failure (level C).

2.15. Pacemakers

- Pacemakers have no established role in the treatment of heart failure except for conventional bradycardia indication.
- Resynchronisation therapy using bi-ventricular pacing may improve symptoms and sub-maximal exercise capacity (level B), but its effect on mortality and morbidity is as yet unknown.

2.16. Arrhythmia devices and surgery

2.16.1. Implantable cardioverter defibrillators (ICD)

- There is as yet no specifically defined role for ICD in chronic heart failure (level C) as available data from controlled trials have not specifically addressed its effect in heart failure patients

2.17. Heart transplantation, ventricular assist devices and artificial heart

2.17.1. Heart transplantation

- Heart transplantation is an accepted mode of treatment for end stage heart failure. Although controlled trials have never been conducted, it is considered to significantly increase survival, exercise capacity, return to work and quality of life compared to conventional treatment, provided proper selection criteria are applied (level C).

2.17.2. Ventricular assist devices and artificial heart

Current indications for ventricular assist devices and artificial heart include bridging to transplantation, transient myocarditis and in some permanent hemodynamic support (level C).

2.18. Choice and timing of pharmacological therapy of heart failure due to systolic LV dysfunction

- Before initiating therapy, the correct diagnosis needs to be established and considerations should be given to the Management Outline presented in Table 3 (see also Table 9).

2.19. Asymptomatic systolic LV dysfunction

Treatment with an ACE inhibitor is recommended

Table 9
Chronic heart failure –choice of pharmacological therapy

LV systolic dysfunction	ACE inhibitor	Diuretic	Beta-blocker	Aldosterone antagonists	Cardiac glycosides
Asymptomatic LV dysfunction	Indicated	Not indicated	Post MI	Not indicated	With atrial fibrillation
Symptomatic HF (NYHA II)	Indicated	Indicated if fluid retention	Indicated	Not indicated	(a) When atrial fibrillation; (b) when improved from more severe HF in sinus rhythm
Worsening HF (NYHA III–IV)	Indicated	Indicated, combination of diuretics	Indicated (under specialist care)	Indicated	Indicated
End-stage HF (NYHA IV)	Indicated	Indicated, combination of diuretics	Indicated (under specialist care)	Indicated	Indicated

HF, heart failure; LV, left ventricular; MI, myocardial infarction.

in patients with reduced systolic function as indicated by a substantial reduction in left ventricular ejection fraction. In patients with asymptomatic left ventricular dysfunction following an acute myocardial infarction add a beta-blocker.

2.20. Symptomatic systolic LV dysfunction-heart failure NYHA class II

Without signs of fluid retention: ACE inhibitor — titrate to the recommended target doses. Add a beta-blocker and titrate to target dosages (see full text for target dosages of ACE inhibitors and beta-blockers). If patients remain symptomatic (Fig. 3):

- Consider alternative diagnosis.
- When ischaemia is suspected, consider nitrates or revascularisation before adding a diuretic.
- Add a diuretic.

With signs of fluid retention — diuretics in combination with an ACE inhibitor and a beta-blocker: first, the ACE inhibitor and diuretic should be co-administered. When symptomatic improvement occurs, i.e. fluid retention disappears, try to reduce the dose of diuretic, but the optimal dose of the ACE inhibitor should be maintained. To avoid hyperkalaemia, any potassium-sparing diuretic should be omitted from the diuretic regimen before introducing an ACE inhibitor. Potassium-sparing diuretics may be added if hypokalaemia persists. Add a beta-blocker and titrate to target dosages. Patients in sinus rhythm receiving

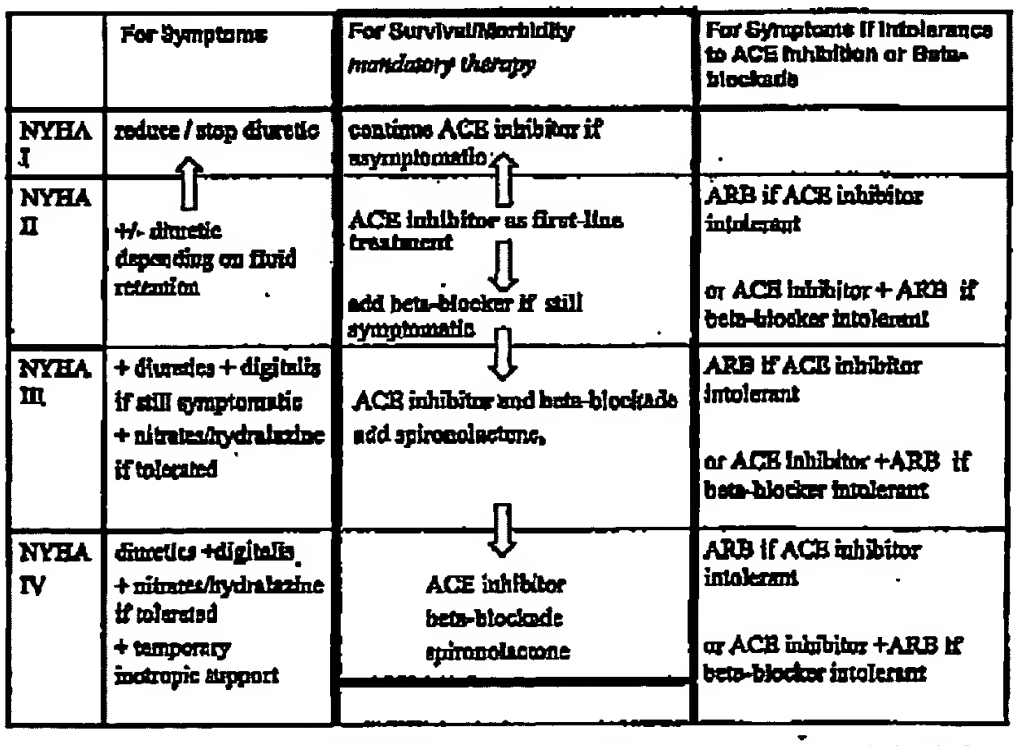

Fig. 3. Pharmacological therapy of symptomatic chronic heart failure due to systolic left ventricular dysfunction.

cardiac glycosides, who have improved from severe to mild heart failure, should continue cardiac glycoside therapy. In case of intolerance to ACE inhibition or beta-blockade, consider addition of an ARB to the remaining drug. Avoid adding an ARB to the combination ACE inhibitor and a beta-blocker.

2.21. *Worsening heart failure*

For most frequent causes of worsening heart failure see full text. Patients in NYHA class III who have improved from NYHA class IV during the preceding 6 months or are currently NYHA class IV should receive low-dose spironolactone (12.5–50 mg daily, Table 8). Cardiac glycosides are often added. Loop diuretics can be increased in dose. Combinations of diuretics (a loop diuretic with a thiazide) are often helpful (Fig. 3). Consider cardiac transplantation

2.22. *End stage heart failure (patients who persist in NYHA IV despite optimal treatment and proper diagnosis*

Patients should be (re)considered for heart transplantation. Consider palliative treatment in terminal patients, e.g. opiates for the relief of symptoms (Fig. 3).

2.23. *Management of heart failure due to diastolic dysfunction*

There is little evidence from clinical trials or observational studies as to how to treat diastolic dysfunction, and there is uncertainty about the prevalence of diastolic dysfunction in patients with heart failure symptoms and a normal systolic function in the community.

2.24. *Pharmacotherapy of diastolic heart failure*

The recommendations provided below are largely speculative, as limited data exist in patients with preserved LV systolic function or diastolic dysfunction (level C), patients being excluded from nearly all large controlled trials in heart failure.

1. Beta-blockade to lower heart rate and increase the diastolic period.
2. Verapamil-type calcium antagonists may be used for the same reason. Verapamil may lead to a functional improvement in patients with hypertrophic cardiomyopathy.
3. ACE inhibitors may improve relaxation and cardiac distensibility directly, may have a long-term effect through regression of hypertrophy and reduce hypertension.
4. Diuretics may be necessary when episodes with fluid overload are present, but should be used cautiously so as not to lower preload excessively and thereby reduce stroke volume and cardiac output.

2.25. *Heart failure treatment in the elderly*

The therapeutic approach to systolic dysfunction in the elderly should be principally identical to that in younger heart failure patients with respect to the choice of drug treatment.

2.26. *Arrhythmias*

- In the approach to arrhythmia it is essential to recognise and correct precipitating factors, improve cardiac function and reduce neuro-endocrine activation with beta-blockade, ACE inhibition and possibly aldosterone receptor antagonists (level C).

2.26.1. *Ventricular arrhythmias*

- In patients with ventricular arrhythmias, the use of antiarrhythmic agents is only justified in patients with severe, symptomatic, sustained ventricular tachycardias and amiodarone should be the preferred agent (level B).

2.26.2. *Atrial fibrillation*

- For persistent (non self-terminating) atrial fibrillation, electrical cardioversion should always be considered, although its success rate may depend on the duration of atrial fibrillation and left atrial size.

There is no evidence in patients with persistent atrial fibrillation and heart failure suggesting that restoring and maintaining sinus rhythm is superior to control of heart rate.

In permanent (cardioversion not attempted or failed) atrial fibrillation, rate control is mandatory.

In asymptomatic patients, beta-blockade, digitalis glycosides or the combination may be considered, in symptomatic patients digitalis glycosides are the first choice (level C). If digoxin or warfarin is used in

combination with amiodarone, their dosages may need to be adapted.

2.27. Symptomatic systolic left ventricular dysfunction and concomitant angina or hypertension

Specific recommendations in addition to general treatment for heart failure due to systolic left ventricular dysfunction.

If angina is present:

1. Optimise existing therapy, e.g. beta-blockade.
2. Consider coronary revascularisation.
3. Add long-acting nitrates.
4. If not successful: add second generation dihydropyridine derivatives.

If hypertension is present:

1. Optimise dose ACE inhibitors, beta-blocking agents and diuretics.
2. Add spironolactone or ARBs if not present already.
3. If not successful: try second generation dihydropyridine derivatives.

2.28. Care and follow-up

Comprehensive non-pharmacological intervention programmes are helpful in improving quality of life, reducing readmission and decreasing cost (level of evidence B).

However, it is unclear what the best content of organisation of these programs is. Different models (e.g. heart failure outpatient clinic, heart failure nurse specialist, community nurse specialist, patient telemonitoring) may be appropriate depending on the stage of the disease, patient population and national resources (level of evidence C).

Although basic agreement can be achieved on the content of care needed by patients with heart failure, the organisation of the care should be closely adapted to the needs of the patient group and the resources of the organisation.

References

[1] Task Force for the Diagnosis and Treatment of Chronic Heart Failure of the European Society of Cardiology. Guidelines for the Diagnosis and Treatment of Chronic Heart Failure. Eur Heart J 2001;22:1527–60.